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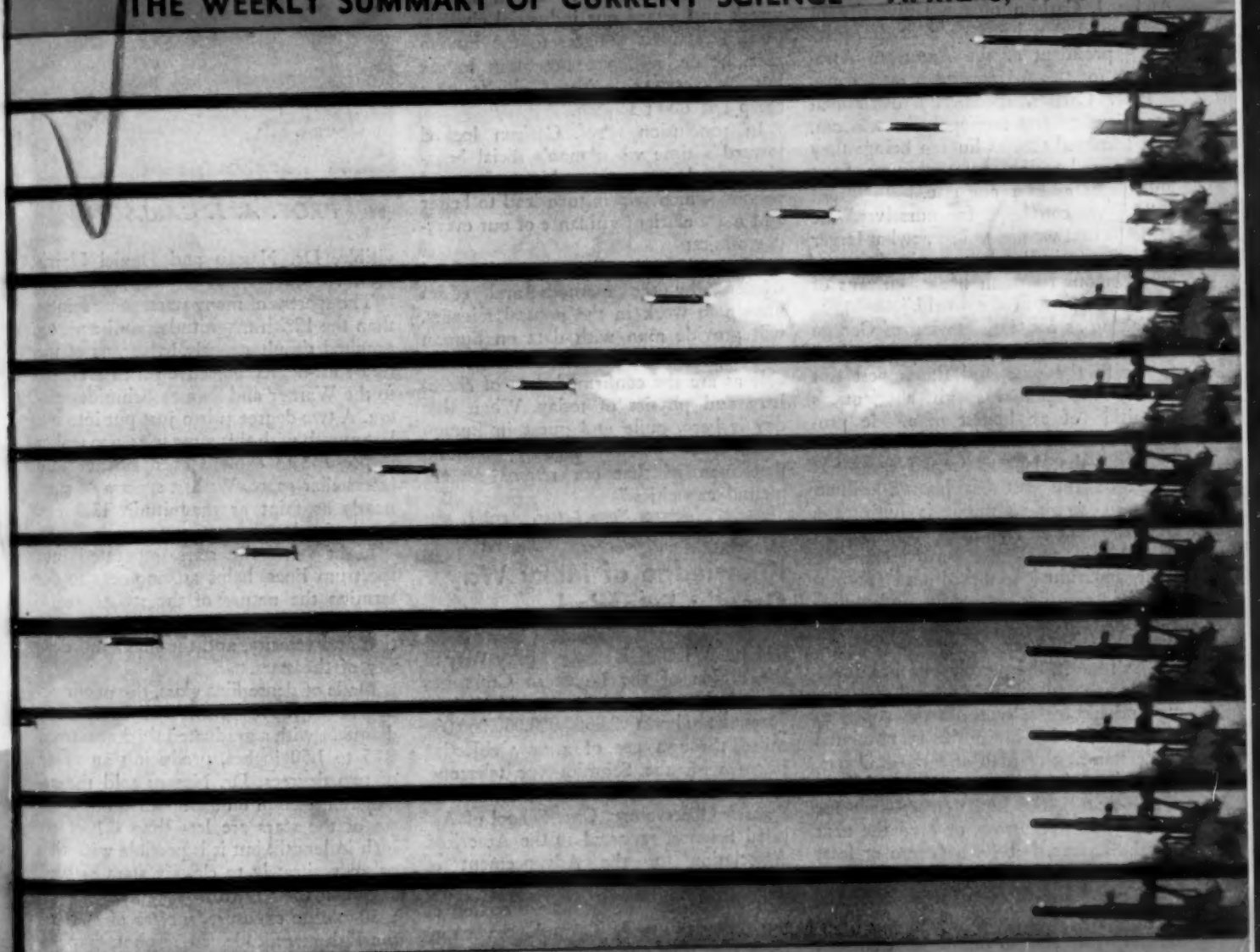

Launching A Rocket

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A SCIENCE SERVICE PUBLICATION

1921 TWENTY-FIFTH ANNIVERSARY 1946

GENERAL SCIENCE

Scientists and Peace

They ought to do their share toward organizing a saner world, retiring president of the American Association for the Advancement of Science states.

➤SCIENTISTS ought to do their share towards organizing a saner, more peaceful world, because their training qualifies them to see things more objectively and should enable them to decide and act with less prejudice and passion, Prof. Anton J. Carlson of the University of Chicago declared in his address as retiring president of the American Association for the Advancement of Science.

Prof. Carlson specifically disclaimed for scientists any monopoly in wisdom, and admitted that as human beings they are exposed to the same pressures, fears and hopes as everyone else.

"All we can hope for ourselves," he said, "is that we apply a somewhat larger element of the integrity, gained in science, in our common life as citizens of our nation and of the world."

Taking as his text a saying of George Washington's, "Let us raise a standard to which the wise and the honest can repair," the speaker sought a scientist's definition of an honest man. He proposed:

"Man—that is, the human race—has dwelt on this earth at least a million years. It seems to me it is high time that those who would be wise should look ahead as to the consequences of their individual, national and international actions, not only today and tomorrow, but a hundred, a thousand, a hundred thousand years ahead.

"As I see it, the person who has developed some control of his greed, his vanity and his fears; who has developed to the limit of his brain the accumulated understanding of man and the universe, and who thinks in terms of his fellowman—that is, the human race—not for the day, for tomorrow, or even the next hundred years, but for a future at least as long as our human past; and who at the same time uses all his influence, without violence or coercion, to prevail on his fellowman to follow his example, that individual is entitled to the connotation 'wise'."

If no more than a corporal's guard of such persons can be found in each country, Prof. Carlson expects that they will eventually be able to leaven the lump of the present chaotic world, with its pious professions in Atlantic Charters and the aims of the UNO, and the great nations' incompatible lying diplomacy and truculent rearmament.

Even if war should come again, it would not mean the end of the human race, he prophesied. It would merely wreck and retard our industrial civilization. The worst dangers to the human race, he declared, are not atom bombs but "slavery, parasitism, chicks that chirp but don't scratch."

In conclusion, Prof. Carlson looked toward a time when man's social behavior will become the subject of a real science, which will in turn lead to better and more efficient guidance of our everyday affairs:

"Some day our colleagues in the social sciences, by the methods and ethics known to work in the natural sciences, will provide man with data on human behavior, data as reliable and as unavoidable as are the confirmed data of chemistry and physics of today. When that day is here, guile and guess in human relations will surely recede, assuming that man of that era retains present mental capacities."

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ASTRONOMY

Knowledge of Milky Way Greatly Extended

➤ KNOWLEDGE of the Milky Way in the region of the Northern Cross has recently been extended some 4,000 light years, or almost 23,500,000,000,000,000 miles, through use of a new objective prism with the Schmidt-type telescope. Dr. J. J. Nassau of the Warner and Swasey Observatory, Case School of Applied Science, reported to the American Association for the Advancement of Science meeting.

In the Milky Way, in the direction of the constellation of Cygnus, the swan, there is at least one cloud of highly luminous blue stars, from seventh magnitude, just too faint to be seen with the naked eye, to stars as faint as the 13th magnitude. Imbedded in this cloud of stars is a mass of obscuring interstellar material which does not interfere with the light of the nearby stars, but definitely diminishes the number of faint or distant stars visible, Dr. Nassau and Daniel Harris found.

PROF. A. J. CARLSON

The spectra of many stars, some fainter than the 12.5th magnitude, can be photographed simultaneously by means of the new four-degree objective prism attached to the Warner and Swasey Schmidt camera. A two-degree prism just put into use last month with this same telescope makes it possible to explore even farther into interstellar space. With it spectra of stars nearly as faint as magnitude 13.5 can be obtained.

Light from the stars, separated into spectrum lines, helps astronomers to determine the nature of the stellar radiations, surface temperatures, stellar motion and velocity, and the mass and density of the stars.

Made of dense flint glass, the new two-degree objective prism is 24 inches in diameter with a graduated thickness from 0.75 to 1.50 inches, producing an angle of two degrees, Dr. Nassau told the association section on astronomy. The spectra of the stars are less than 0.1 of an inch in length, but it is possible with this prism accurately to classify stars as well as obtain their intrinsic brightness. With a 20-minute exposure, spectra of stars of the 13th magnitude can be photographed readily.

Basically, a Schmidt instrument is a spherical mirror before which is placed a thin glass correcting lens. This makes possible with the astronomical instrument photographs of large regions of the sky far superior to those taken with ordinary lens-type cameras.

Science News Letter, April 6, 1946

CHEMISTRY

New Elements Synthesized

Four chemical elements, 43, 61, 85, 87, produced and investigated by tracer technique. Tracers seen as having unlimited possibilities in research and disease.

➤ THE PRODUCTION by artificial means of four chemical elements, numbers 43, 61, 85, and 87, now known to be extremely rare or non-existent in nature, was made known by Dr. Glenn T. Seaborg, professor of chemistry at the University of California and codiscoverer of the elements plutonium, 95 and 96 during atomic bomb research, in an address to the physical chemistry section of the Pittsburgh section of the American Chemical Society.

With the manufacture and investigation of the properties of these four elements, all the gaps in the table of chemical elements have been closed. Although all four of these elements have been reported discovered in earlier years by various experimenters, the researches reported by Dr. Seaborg call in question these earlier reports based on less positive methods of analysis.

Actually the experiments with these elements have been performed with unseeable and unweighable amounts by means of the "tracer" technique. The course of the elements in reactions is followed by their radioactivity instead of by chemical means.

Radioactive isotopes of element 43 were produced by the bombardment of molybdenum with deuterons, the nuclei of heavy hydrogen atoms. Experiments by Drs. C. Perrier and Emilio Segre showed that the chemical properties of 43 resembled those of its heavier homolog, rhenium, to a greater extent than they resembled those of manganese, the lighter element most resembling it.

Radioactive forms of element 61 were formed in experiments by both Drs. J. D. Kurbatov and Marion L. Pool and Drs. C. S. Wu and Emilio Segre. This element is a rare earth, with a behavior that is to be expected from a rare earth.

Radioactive element 85, whose isotope has an atomic weight of 211, was made by bombarding bismuth with 32,000,000 electron-volt alpha particles. Its general behavior is that of a metal, with little resemblance to the other halogens, of which iodine is typical. Drs. Dale R. Corson, K. R. Mackenzie and Emilio Segre investigated its properties.

A radioactive form of element 87, given the name AcK, has been discovered resulting from the decay of actinium. This isotope discovered by Dr. M. Perey has a mass of 223 and lives but a short time. It decays with negative beta particle emission with a half life of 20 minutes. As was expected, it behaves like a heavy alkali metal.

(Earlier reports of the discovery of these elements, now called in question, were made, in the case of 43, named masurium, in 1925, and element 61, named illinium, in 1926, while 85, called alabamine, and 87, called virginium, were announced in 1931. The chemical literature records several earlier claims of finding some of these elements.)

Rival Microscope

➤ UNLIMITED possibilities for the application of radioactive tracers to scientific problems and to the treatment of disease were foreseen by Dr. Seaborg.

"Many biologists believe that artificial radioactivity has given biology and medicine," said Dr. Seaborg, "what is probably the most useful tool for research since the discovery of the microscope because all the elements and compounds in biological system can be tagged and their course through living systems studied."

The chain reacting pile used in the production of plutonium for the manufacture of atomic bombs produces large amounts of neutrons of high intensity and as a result it is possible to produce in large quantity isotopes that are used as "tags" or "tracers".

One of the most useful of the isotopes thus made is radioactive carbon 14, which has a half-life of some thousands of years. Since carbon is so important in the living world, being able to tell where a carbon atom travels and what it does by spying upon it with an apparatus that spots its explosive decaying will give scientists new information on what happens during living and chemical changes.

Radioactive triple-weight hydrogen, atomic weight 3, can now be produced by means of the intense neutron sources in the atomic bomb manufacture. It has a half-life span of 30 years and it can be used effectively to label hydrogen in organic compounds both in chemical processes and in living things, normal or diseased.

Radiophosphorus, radiosulfur and radioiodine are among the other radioactive isotopes that, according to Dr. Seaborg, will offer many opportunities for important research.

One exciting finding is that radiophosphorus accumulates in leukemic tissues, thus opening the possibility that it can be used in the treatment of this cancer-like disease of the blood cells. The radiophosphorus would bombard the diseased tissues with beta rays to a greater degree.

The study of cancer is another possible use of tracers. As in the case of leukemia, Dr. Seaborg explained, "there is the therapeutic possibility of effecting the selective deposition of the radioactive material in the cancerous tissue."

"It has occurred to many investigators," he reported, "that it should be possible in the future to synthesize some compound containing a radioactive substance, this compound having the property of being selectively absorbed by the cancerous tissues so that the radioactive rays can act directly at this spot without giving harmful effects on the body's healthy tissue."

Tagging of bacteria with radioactive carbon 14 is a possibility, Dr. Seaborg declared. A beginning has been made by tagging the tuberculosis bacillus with radioactive phosphorus but the experiments have not yet been completed.

Radioactive iodine has been used in the treatment of patients suffering from hyperthyroidism by Drs. J. G. Hamilton and M. H. Soley, while Dr. J. H. Lawrence has been successful in the application of radioactive phosphorus to the temporary control of the blood disease, polycythema vera.

Industry will also benefit from radioactive materials resulting from the atomic bomb researches and the manufacture of plutonium, Dr. Seaborg predicted. Radioactive indicators will be used to follow the course of products and impurities in large industrial processes.

As an example of one chemical problem that could be studied with carbon 14, he cited the mechanism of catalytic cracking, isomerization and alkylation of hydrocarbons which are of profound interest to the oil industry.

Radioactive tracers may also help solve fundamental problems in genetics, such as the connection between the genes in the chromosomes that cause brown eyes and the actual deposition of the pigment in the cells of the iris.

PHYSICS

Plutonium "Denatured"

Best guess as to meaning of State Department hint is that it is done by mixing with a material to form a combination that will not explode.

By WATSON DAVIS

➤ THE STATE Department committee report on atomic energy control lifts slightly some of the secrecy surrounding atomic fission and atom splitting, but the scientific world still lacks data that in the normal course of peacetime science would be published for the world to know.

Most interesting is the hint that plutonium, one of the atomic bomb elements (the other being uranium 235), can be "denatured."

Guessing as to how this could be done (and, please, Gen. Groves, note that this is my guess only, which I hope does not come under Army security) it may be that the plutonium that fissions explosively could be so contaminated with another non-fissionable isotope of the same element that it could not be exploded. Possibly separating the fissionable isotope useful in bomb making would be a much more difficult task than separating out the bomb element from the material with which it is mixed during its manufacture from uranium 238. This separation is one of the major tasks of the gigantic plant at Hanford, Wash.

Unless the plutonium is sufficiently pure and undiluted by extraneous materials, there will not be enough neutrons to produce the violent and extremely fast chain reaction of the atomic bomb explosion. Each splitting plutonium atom gives out from one to three neutrons, but these must have the chance to reach other fissionable plutonium atoms in a very short space of time without being absorbed and made useless for that purpose.

Many kinds of materials can produce this necessary dilution, but the point in control of plutonium if it were distributed for peaceful power producing uses is that the diluting or denaturing material must be very difficult to separate from the fissionable material. Otherwise a few chemically-wise international gangsters might take improperly denatured plutonium and turn it into purified fissionable plutonium and the first the world would know about this would be the explosion of an atomic bomb.

Another item in the State Department report being studied by the Senate Special Atomic Energy Committee emphasizes more plainly than before that thorium can be the source of fissionable material. This has been implied in the Smyth report, but just what process is used has not been stated. Evidently thorium with the aid of uranium may be transmuted into fissionable atomic bomb material, just as plutonium can be manufactured from uranium isotope 238. It is for this reason that thorium as well as uranium needs to be placed under control if the atomic bomb is to be controlled.

Thorium is a fairly common element in the earth's crust, but deposits of it are presumably not so concentrated or easily used as those of uranium.

Science News Letter, April 6, 1946

Another Major Secret

➤ ANOTHER MAJOR secret has been added to the world's lack of information about the atomic bomb. This is the nature of the denaturing material used to make uranium 235 or plutonium incapable of being turned into an explosive bomb. This contaminating material is something that has been known about for several years during atomic research. Its possible use in solving the difficulties of making atomic bomb materials available to the world has just been announced in the State Department's report on the international control of atomic energy. Its removal from the denatured fissionable material would take a large and lengthy manufacturing operation.

The purpose of the denaturing is to put all the bomb making materials of the world in such a state that only after a lapse of 1½ to 5 years, depending upon the estimates involved, could an atomic bomb be made out of the material. This would allow the distribution, under the proposed Atomic Development Authority plan, of ample quantities of uranium materials that could be used for peaceful production of power.

The evident purpose of keeping the denaturing substance a secret now is to have more unrevealed information to be presented to the United Nations when they accept international control. If the plants and mines producing uranium and thorium are owned by the United Nations, the first step in the relinquishing of national sovereignty has been taken.

The world could best have atomic power for industry and other purposes without the menace of atomic bomb sneak attacks if the sources of atomic power, the world's resources in uranium and thorium, were put under international control by UNO. The international organization would operate the plants through the stage at which the products could be diverted to the making of atomic explosives, and would turn out the denatured product which is safe to use for all legitimate research purposes. If any of the so-called dangerous plants manufacturing U-235 or plutonium were sud-

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denly seized by any nation and thus removed from the control of the United Nations, that would be a virtual declaration of war because the seizing nation, if left alone, within a year or two, could produce an atomic bomb. An essential part of the control by the United Nations of fissionable material would be the ownership and operation of all deposits of uranium and thorium and the plants for extracting these elements. A first step would be an extensive geological exploration of the surface of the earth to discover all deposits of uranium and thorium.

Uranium and thorium are the only two elements, according to the report, which need to be controlled because without them no fissionable materials could be made.

The scientists working on the questions of whether other elements can produce atomic energy by a sustained reaction have relied greatly upon what is called the "packing curve," according to Dr. Charles Allen Thomas, vice president and technical director of the Monsanto Chemical Co., one of the members of the board of consultants to the State Department's committee, here. According to theory developed from the packing curve, only the heaviest nuclei and the lightest nuclei have the subatomic configuration which would allow them to release atomic energy.

While the light atoms do furnish the energy that keeps the stars shining, the scientists who provided information for the report see no practicable way either to provide the millions of degrees of temperature necessary or to create the containers for materials at such temperatures under terrestrial conditions, so they have discarded the possibility of obtaining energy from the disintegration of these light elements.

One essential idea in the report is the distribution of stock piles of fissionable materials and the "dangerous" plants manufacturing fissionable materials throughout the world so that every major region contains them. Thus no one country or region would have a monopoly.

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CHEMISTRY

Uranium Is Vital Factor

It is the only essential element for constructing an atomic bomb, but thorium may also be used in chain reactions, report reveals.

➤ URANIUM STANDS OUT as unique among the 92 naturally occurring elements, according to new information released in the State Department's Report on the International Control of Atomic Energy. Only uranium can maintain the chain reaction which is the basis for all development of atomic power, whether for peace or war.

Uranium is one of eight or nine heavy, radioactive elements about which there has been speculation ever since the announcement last August of the principles of atomic fission. In particular, the role of uranium's sister element, thorium, largely used to make self-luminous watch dials and light switches, has evoked curiosity.

In the new report it is revealed that thorium cannot of itself maintain a chain reaction, but it can be used with uranium for that purpose. It could, in effect, be used to stretch the uranium supply. Thorium is therefore included with uranium under the restrictive provisions suggested in the State Department's report on atomic energy control.

The fact that thorium and uranium frequently occur together in the same geological formation greatly simplifies this plan for control by international authority of the sources of fissionable material. Moreover, the type of geological formation where these strange minerals occur is unusual and relatively easy to spot.

We have the authority of the scientists who know all the secrets of atomic energy so far discovered that these elements, thorium and uranium, are the only ones over which it is necessary to maintain a watch to insure their use for constructive purposes. Familiar materials, such as iron and lead, may be used freely in construction of atomic power plants, with no danger of producing bombs as a by-product. Nobody is going to get fissionable atoms out of the clay at our feet.

With the world's supply of the dangerous elements, uranium and thorium, and their artificially created analogues, neptunium and plutonium, under international control, the race for fissionable elements as weapons would end in stalemate. At the same time, their use as sources of power and as research tools would offer stimulating opportunity for untrammeled investigation by scientists of all countries.

New power sources, secrets of nature's production of food and fuel, and new hope in our struggle to understand and control cancer are some of the constructive problems awaiting settlement of the dangerous side of the atomic power question.

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Control of Cancer Instead of Atomic Bombs

➤ CONTROL OF CANCER instead of manufacture of bombs is the alternative program offered research scientists by the new report on international control of atomic energy issued by the State Department. Research on atomic fission by-products, although not as spectacular at first glance as atomic power or atomic bombs, will undoubtedly, in the long run, be the great achievement of the atomic age.

These by-products, which are the radioactive forms of the common elements, can replace the non-radioactive forms of the same elements in the tissues of plants and animals. By substituting them for the common forms, individual atoms can be traced through the complicated maze of life processes in plant, animal or man. By this means, chemists are learning the steps by which the plant builds carbon dioxide from the air into the starches and sugars on which we rely for food. Selective absorption of radioactive materials by cancer tissues can be used to place the remedial rays given off by these materials in the tissues they are to treat.

Researches of this type, already begun by scientists in the atomic power research program, have been greatly hindered by restrictions growing out of secrecy conditions deemed necessary on account of the military control of atomic power as a weapon. With the establishment of international control which will limit use of dangerous fissionable material but allow safely denatured material to be released for experimental use, great strides in man's control over his environment are to be expected.

In addition to the radioactive fission products which will play so important a part in chemical and physical researches in the atomic age, there will be developed from the atomic fission reactors considerable quantities of heat which may be usefully employed either for operating steam plants or for generating electricity. An earlier report of

the Secretary of War's Interim Committee on Atomic Energy, whose findings are in part incorporated in the statement just released, considers the present prospects for utilization of this power.

"We see characteristic limitations," says this report, "and characteristic advantages in atomic power which make us regard it in great measure as a supplement to existing sources, and an incentive to new developments, rather than as a competitor, let us say, to coal or to petroleum products."

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GENERAL SCIENCE

International Control

An agency actively working on developments in the field of atomic energy is urged by State Department consultants for peaceful control.

➤ CONTROL OF ATOMIC energy by an international agency actively working on development in the field is the proposal handed the State Department by its board of consultants for peaceful control of man's most fearful weapon.

The 78-page report of the five-man board was released with a foreword from Secretary of State Byrnes stating that it is being made public "not as a statement of policy but solely as a basis for discussion."

The chairman of the board was David E. Lilienthal, chairman of the Tennessee Valley Authority, and it included Chester I. Barnard, president of the New Jersey Bell Telephone Co.; Dr. J. Robert Oppenheimer, University of California and California Institute of Technology scientist who directed work at the Los Alamos, N. Mex., laboratory of the Manhattan District; Dr. Charles Allen Thomas, vice-president of the Monsanto Chemical Co., St. Louis, Mo., and Harry A. Winne, vice-president of the General Electric Co., Schenectady, N. Y.

Pointing to the need for international control of the atomic weapon, the report introduced a new concept of the problem by asserting that "only if the dangerous aspects of atomic energy are taken out of national hands is there any reasonable prospect of devising safeguards against the use of atomic energy for bombs." It explains the difference between safe and dangerous activities with a promise that there are processes for utilizing radioactive materials that cannot be made into bombs.

The State Department's consultants emphasize that the group exercising international control must also assume a responsibility for the development of atomic energy.

"Only if the international agency was engaged in development and operation could it possibly discharge adequately its functions as a safeguarder of the world's future," the report declares.

New advances in technology may be confidently expected, the board said, and "Those in whose hands lies the prevention of atomic warfare must be the first to know and to exploit technical advances in this field."

Explaining that atomic energy cannot be policed out of existence, the group charged, "To 'outlaw' atomic energy in all of its forms and enforce such a prohibition by an army of inspectors roaming the earth would overwhelm the capacity and the endurance of men, and provide no security."

Comparing the enforcers of such a suppression to prohibition agents in the United States, the report urges the control body to be pioneers in a new and creative field. Referring to the unpublished findings of the Secretary of War's Interim Committee on Atomic Energy, the State Department document quoted portions predicting important peacetime uses for the war's mightiest weapon.

With the materials for atomic weapons kept out of national hands we can prevent war use of them, the report said, adding that the international agency must have absolute control over the raw material.

Thus, the board declared, the problem of enforcement is drastically reduced. The technical problems of what use a nation is making of dangerous materials will not enter into the control if the mining of uranium ore or possession of it are illegal, according to the State Department's consultants.

Summing up their case for international control of atomic energy, the board said, "We conclude that the international development and operation of potentially and intrinsically dangerous activities in connection with atomic energy would bring the task of security within manageable proportions because of the elimination of the hazards of rivalry between nations."

Individual nations and their citizens would be licensed to carry on all safe operations with a minimum of inspection, according to the plan.

First function of the proposed agency would be to bring under its control all supplies of uranium and thorium and set up continuous surveys to locate new sources.

Plants such as those at Oak Ridge, Tenn., and Hanford, Wash., might be established to produce useful types of atomic reactors to further the peaceful development of atomic power. Research activities are contemplated to increase knowledge of atomic energy and extend its safe uses.

All dangerous products would be under the agency's strict control, but "denatured" materials could be leased to nations or individuals for safe uses.

"When the plan is in full operation there will no longer be secrets about atomic energy," the board said.

"We believe that this is the firmest basis of security," the group declared. "In the long term there can be no international control and no international cooperation which does not presuppose an international community of knowledge," they concluded.

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MEDICINE

Penicillin Is Better Than Streptomycin for Syphilis

➤ PENICILLLIN is better medicine for syphilis than its sister-antibiotic, streptomycin, it appears from studies of rabbit syphilis reported by Dr. Wolcott B. Dunham and Dr. Geoffrey Rake, of the Squibb Institute for Medical Research. (*Science*, March 22.)

Streptomycin did cure some of the rabbits of their syphilis, but comparison of the dosage needed with the dose of penicillin that would cure syphilis led the scientists to conclude that "penicillin G is more than 3,000 times as effective" as streptomycin.

Treatment of four cases of syphilis in humans, reported by Dr. W. E. Herrell and Dr. D. R. Nichols of the Mayo Clinic, and referred to by the Squibb scientists, seems to bear out the results of the rabbit studies. The human patients improved but relapses occurred even when 10,000,000 units of streptomycin had been given over a period of 10 days.

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Sound travels more than four times as fast through water as through air.

GENERAL SCIENCE

Blind Spots of Science

Science Service director calls for exploration of longer life, viruses, human personality, chemical elements, universe, photosynthesis, protoplasm, automatism.

➤ MAJOR BLIND spots in man's scientific knowledge, unknowns that are worthy of science's most skillful and energetic probings, were listed by Watson Davis, director of Science Service, in a paper before the American Association for the Advancement of Science.

These constitute the stuff of the future upon which technologic advances will be based, Mr. Davis declared, provided scientists are released from the inhibiting secrecy in which the military wish to continue to ensnare them.

The ten major unexplored areas listed by Mr. Davis are:

1. Living longer: the prolongation of life, the retarding of old age, the prevention of premature senility, which means the conquest of degenerative diseases, among them cancer, heart and circulatory disorders, nephritis, arthritis, and diseases of the respiratory system and the brain. We should be able to live and work a half generation longer.

2. Virus conquests: least controlled of all infectious diseases those caused by viruses, such as colds, poliomyelitis, need their nemeses, their sulfas and antibiotics.

3. Healthier personalities: mental ills, ranging from chronic grouches to disabling psychoses, take major tolls. Disordered personalities have physical, mental and emotional bases. Mentally warped personalities give rise to crimes against society, including making of wars.

4. Exploration of the elements: new chemical elements are still to be discovered, probably a half dozen or so. Transmutations (not alone of uranium) and properties of older ones need exploration. Undiscovered sources should be sought for elements little-used because scarce. Particles within the atomic nucleus yet unidentified may exist.

5. Exploration of the universe: the impact of astrophysical knowledge of the universe around us may be more philosophical or religious than technologic, but sun, stars and galaxies have their down-to-earth effects. Experiments of immense time and size are in progress.

6. The secret of photosynthesis: despite the energy released from within two atomic nuclei, our main source of energy is the sun, whose radiation is converted by photosynthesis in growing plants, a process we do not understand and can not duplicate in any factory.

7. The secret of protoplasm: the living cell is the seat of life itself. An explanation of its protoplasm may explain life. Nuclear chemistry of the living cell may be more revealing than nuclear chemistry of the elements.

8. Automatism: the lever, wheel and such simple devices were beginnings; steam, electrical and internal combustion engines were further steps; the electron tube is the prime servant of automatic operation today, peaking in complex electronic computing machines that almost think in a routine way. Automatic operation applied to factory, farm and home, assuming the burden of human drudges, may give time for more creative thinking and doing.

9. World brain: civilization's memory is in its records, its books, its literature, its handed-down lore and customs. Overburdened human brains forget. Our world organization or disorganization of knowledge has its lapses of incomplete records, its Babel of languages, its geographical stagnation, its confusion of classification and its overpowering bulk. The intelligence of the world may be intelligent enough to mobilize for use its intelligence.

10. Psychological welfare: in the stress of war, all the skill of psychological interpretation (propaganda, if you will) and all the machinery of mass communication are devoted to world-wide mutual understanding (of our side). This psychological warfare needs to become peaceful psychological welfare, a process of peoples knowing and understanding within and across man-made borders. This will be the essence of peace, which history shows is one of the greatest of unknowns, worthy of the most intense and earnest scientific research.

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ELECTRONICS

Largest Turbine Generator Is Under Construction

➤A GIANT, 100,000-kilowatt turbine generator, largest of its type in the world, is now under construction at the General Electric Company's turbine factory in Schenectady, N. Y.

HUGE FORGING—Many weeks of highly-skilled work will be required to transform this 75,000-pound forging into a precision-machined shaft, which will operate at 3,600 revolutions per minute. It will be used on the huge turbine-generator under construction by General Electric. Parts of the turbine known as "buckets" will operate at the supersonic speed of nearly 900 miles per hour.

Designed to operate at 3,600 revolutions per minute, the streamlined generator will be 77 feet long and 17 feet in maximum width. Turbine buckets on the generator will rotate at the record velocity of 1,300 feet per second or nearly 900 miles per hour.

Steam, entering the turbine at 1,000 degrees Fahrenheit with 1,250 pounds of pressure per square inch, will pass through a series of bucket wheels rotating the turbine rotor and driving the huge generator.

In one-tenth of a second, the steam's temperature drops to about 70 degrees Fahrenheit and the air pressure becomes a near vacuum. The steam becomes water and goes back into the power plant system to again be heated into steam.

Huge rough castings are used in the construction of the generator which is being built for the Public Service Electric and Gas Co., New Jersey. The forging for the generator shaft weighs 75,000 pounds.

Science News Letter, April 6, 1946

CHEMISTRY

Carrots Lose Rank as Source of Vitamin A

➤ THE AMERICAN diet may be subjected to some overhauling as a result of University of California experiments which indicate that the transformation of carotene into vitamin A in the animal body is only one-sixth as efficient as has been assumed.

Until recently scientists believed that 100% of the carotene in vegetable foods such as carrots and lettuce was converted into vitamin A.

Preliminary experiments at the University of California by Dr. Agnes Fay Morgan, professor of home economics, and Lillian S. Bentley, a researcher, reveal that the guinea pig, who seldom eats anything but greenstuffs, can use vitamin A from animal products such as liver and butter six times as efficiently as he can carotene from vegetables.

After depleting two sets of animals of vitamin A, Dr. Morgan fed one group the same amount of vitamin A from animal products as she did carotene to the other group. Examination of their organs after they were sacrificed showed that the vitamin A group stored six times as much vitamin A as the carotene group.

Dr. Morgan says that the herbivorous guinea pig should be one of the most efficient users of carotene for vitamin A. In view of the facts, she adds, it is probable that other animals, including man, have the same difficulty in transforming carotene. This difficulty could be greater in an omnivorous animal such as man.

The experiments indicate it may be necessary to place less reliance on vegetables as a vitamin A source.

Science News Letter, April 6, 1946

BOTANY

Houseflies Used in Search For Better Celery Strains

➤ THE HOUSEFLY, one of our worst insect pests, is aiding man in research which promises to bring better celery to the American housewife's table.

Flies are being raised by plant breeders at Cornell University to cross-pollinate celery plants. Bees can be used, but flies are more easily handled.

When the flowers are in full bloom, the flies are transferred from the rearing cage into a cheesecloth cage which contains the two plants to be crossed. In going from flower to flower to obtain nectar, the only source of food, they bring about the desired cross pollination.

The effort at Cornell is to develop a blight-resistant celery. When experiments were begun, a celery was being grown in Denmark which was resistant to early blight but was poor in eating qualities. This has been crossed with American varieties to produce a celery resistant to early blight and with better eating qualities than one of the parent plants. Similarly, a Florida celery, resistant to late blight, has been used.

Results of these combined crosses are not yet fully completed, but Prof. R. A. Emerson is confident that within the next five years a blight-resistant celery will be produced which any housewife will be proud to serve on her table.

Plants are brought to Ithaca in October and stimulated into immediate springtime growth by cold storage treatment under fluorescent lights for about a month. Placed in a greenhouse, they usually produce seeds for planting in April.

Science News Letter, April 6, 1946

PSYCHIATRY

Electric Shock Treatment Impairs Memory

➤ ELECTRIC SHOCK treatment, used widely for mental illness, causes an impairment in both memory and intellectual functioning, Dr. Joseph Zubin, of the New York State Psychiatric Institute, reported at the AAAS meeting. His conclusions are based on a five-year study of patients taking the treatment at the Institute.

The loss in both memory and intellectual functioning occurs after the third shock treatment, Dr. Zubin said. Except in a small proportion of cases, the memory loss is gradually restored after the treatments are stopped. In the case of the intellectual impairment, however, it is not yet known whether the patient ever regains his level of ability before the treatments.

There is a slowing up of learning ability after about the third treatment. Memory, in the sense of ability to recognize, is not much affected except for those things only recently observed. But ability to recall is severely impaired.

A patient may recognize a procedure without having any feeling of having done it or seen it before. When asked to do a task he has previously learned, for example, he will deny any knowledge of how to go about it. It is completely new to him and he claims that what he does is just guess. But his "guess" is correct more than 90% of the time.

Science News Letter, April 6, 1946

IN SCIEN

CHEMISTRY

DDT May Be Outmoded By Chemical Relatives

➤ DDT, ONLY NOW coming into general public use as a defense against insects, may presently be rivalled or outmoded by close chemical relatives that are even more deadly, it was suggested in a report of researches presented at the AAAS meeting by Dr. Eugene P. Odom and Prof. W. T. Sumerford of the University of Georgia.

What the two zoologists were hunting for was a chemical like DDT that would be less deadly to fish, and still able to kill insects. Fisheries men, and conservationists generally, are much concerned about ill effects of DDT sprays and dusts distributed over inland waters to kill mosquitoes.

Dr. Odum and Prof. Sumerford used compounds resembling DDT, except that the chlorine atoms in the DDT molecule were replaced with the related elements iodine and fluorine. The fluorine-containing compound was even more poisonous to fish than DDT when used in the same concentration. However, its deadliness to insects was increased to an even greater extent, so that there may be some hope of finding a concentration that will wipe out the mosquitoes and their "wigglers", and yet not prove fatal to the fish.

Science News Letter, April 6, 1946

GEOLOGY

Pearl Found in Mollusk Of Pleistocene Ice Age

➤ SHELLFISH made pearls a million years ago even as they do today. Evidence to this effect is set forth in the *Journal of the Washington Academy of Sciences* (March 15), by Dr. Roland W. Brown of the U. S. Geological Survey.

Some time ago, digging around in a stratum of Pleistocene ice age date in the face of a river bluff in southern Maryland, Dr. Brown found a big snailshell, its cavity filled with mud, which in turn contained numbers of small mollusk shells. When these were taken out and cleaned up, one of them, a little less than half an inch long, presented a small nodule of pearly material grown fast to its inner surface.

Science News Letter, April 6, 1946

NE FIELDS

PLANT PATHOLOGY

Spinach Juice Used Against Plant Disease Viruses

➤ SMALL BOYS are not the only creatures that don't like spinach. Beings that are much smaller (invisibly small, in fact) are apparently paralyzed in the presence of juice squeezed out of spinach leaves. They are the viruses of three different plant diseases, whose reactions to spinach extract were reported before the American Phytopathological Society, meeting jointly with the American Association for the Advancement of Science, by Dr. J. E. Kuntz and Dr. J. E. Walker of the University of Wisconsin.

There appear to be two substances in the spinach juice that have inhibiting effects on viruses. They have not yet been isolated and identified, but they have differing chemical and physical behavior; moreover, each attacks one particular virus but does not harm the other.

The Wisconsin plant pathologists did not say that their unidentified spinach-juice substances are antibiotics, like penicillin and streptomycin, but their description suggests that their action at least resembles that of antibiotics. So long as they are mixed with the viruses in solution, the viruses appear to be without power to produce disease in plants. But the viruses are not destroyed, for if the substances are rendered inactive by suitable physical or chemical means their power to produce disease immediately returns.

Science News Letter, April 6, 1946

MEDICINE

Penicillin Can Help Check Streptococcus Diseases

➤ PENICILLIN can help check epidemics of streptoccocus sore throat and possibly other streptococcus-caused diseases, which include scarlet fever, it appears from a report by Dr. Morton Hamburger, Jr., of Chicago, and Capt. Henry M. Lemon, of the Army Medical Corps. (*Journal, American Medical Association,* March 30)

The mold chemical can do this because it can in many cases promptly eliminate all the streptoccocci from the noses and throats of healthy carriers of these germs. Spread of the germs from patients can be pretty well checked by isolation of the patients. Healthy persons who have the germs in their noses and throats are usually not known to be carrying the germs until they have spread them to many others.

Sulfadiazine can check the spread of streptococci from carriers if the streptococci are susceptible to the sulfa drug. Some strains of these germs, however, become resistant to sulfa drugs.

Penicillin in beeswax peanut oil, injected once a day for five to seven days, promptly eliminated the streptococci from both nose and throat of half the carriers in the group Dr. Hamburger and Capt. Lemon studied. In the other half, the streptococci were eliminated or reduced by more than 98% in number during the period the carriers were getting the penicillin, though after it was stopped, there was a relapse into the carrier state. Most of the carriers in whom relapse occurred, however, scattered very few streptococci into their environment.

"A method is now available," the two doctors conclude, "for controlling well over half the dangerous carriers in event of an epidemic."

Larger doses of penicillin, they suggest, may eradicate the carrier state from even more persons.

Science News Letter, April 6, 1946

ENTOMOLOGY

DDT Effects Studied on Cockroach's Nervous System

➤ DDT KILLS insects by poisoning their nerves, but it does not act uniformly on all insect nervous tissue. Its attack was found to be centered on the afferent, or "ingoing", nerves in experiments carried out by Prof. Kenneth D. Roeder and Miss Elizabeth A. Weiant in the biology laboratories of Tufts College. (*Science,* Mar. 8.)

The two researchers worked on the cockroach, because it is a large insect and has a nervous system that is comparatively easy to reach by micro-dissection and micro-injection methods. They got no results from minute quantities of DDT applied to the central nervous system, to special sense nerves, and to the nerves that carry outgoing impulses to the muscles, but when similar applications were made to the neurons, or action centers, of nerves that carry impulses inward from the muscles, they observed the characteristic reactions of DDT poisoning.

Science News Letter, April 6, 1946

CHEMISTRY

Nation's Penicillin Supply May Be Doubled

➤ THE NATION'S penicillin supply may be doubled as a result of ultraviolet treatment of the spores of the mold that produces the powerful anti-germ remedy, the Wisconsin Alumni Research Foundation announces.

Ultraviolet irradiation, it is explained, causes incompletely understood and unpredictable changes in the genes of spores and seeds with resultant changes in the characteristics of the plants or fungi springing from them. X-ray treatment does the same thing.

Treatment of succeeding generations of spores of penicillium has resulted in a strain that produces nearly 1,000 units of penicillin from every cubic centimeter of broth in which the mold is cultured. In 1940, the yield obtained by the British workers was about two units from the same amount of broth culture.

The two-unit yield was increased to an average of 169 by efforts at the U. S. Department of Agriculture's Northern Regional Research Station at Peoria, Ill. Then Dr. Millislav Demerec, director of the department of genetics at Carnegie Institution, Cold Spring Harbor, N. Y., developed a group of promising spore variants by X-ray treatment.

This stepped up the yield to an average of 369 units. Descendants of these spores were exposed to ultraviolet light by Prof. Myron P. Backus and Dr. John F. Stauffer, University of Wisconsin botanists. The yield increased to an average of 761 units, with a high of 904.

The hunt is still on for an even more efficient producer of penicillin. A strain that can produce two or five times as much of the remedy is a possibility, because the present high yield probably represents less than 1% of all the chemicals produced by the mold, while other molds are known to produce chemicals as complex as penicillin in quantities equal to 5% or 10%.

Scientists besides those named who have worked on the project at the University of Wisconsin include: Prof. William C. Frazier, Prof. Elizabeth McCoy, Prof. W. H. Peterson and Prof. Marvin J. Johnson. The work has been supported partly by Federal funds and partly by the Wisconsin Alumni Research Foundation.

Soil cultures of the new high-producing strain, called Q176, and unpatented, are being supplied gratis on request to penicillin manufacturers.

Science News Letter, April 6, 1946

ORDNANCE

New Weapons Disclosed

Kickless mortar, one-shot flame-thrower, flying bangalore torpedo among weapons developed at the Allegany Ballistics Laboratory.

See Front Cover

➤ WEAPONS THAT SAW action only in the closing stages of the war, and have not hitherto been disclosed to the public, were shown before a small group of industrialists and newspapermen at the birthplace of the bazooka, a hidden ballistics laboratory in a bowl in the West Virginia hills just before it terminated its wartime program, several months after V-J Day. The place was known as the Allegany Ballistics Laboratory; it was operated during the war by scientists of the George Washington University, Washington, D. C., under a contract with the Office of Scientific Research and Development. Most of the weapons developed there are now standard Army equipment.

The bazooka, earliest and smallest of American rocket weapons, has been supplanted by a superbazooka, a projectile bulkier but more completely streamlined than its ancestor, containing a much larger charge of propellant powder that gives it higher velocity, flatter trajectory and considerably increased range. The "payload" of super-high explosive will send a sword of flame stabbing through the thickest of tank armor. The series of photographs on the cover of this SCIENCE NEWS LETTER shows the actual launching of a rocket on the proving grounds at the Allegany Ballistics Laboratory.

Although the Allegany Ballistics Laboratory was established especially for the developing and testing of new rocket weapons, and many of the rockets that wrought such dreadful execution on the enemy, all the way from Sicily to Okinawa, were first produced there, the laboratory's scientific staff was called on to solve a number of other problems that involved the use of the peculiar, giant-grained propellant powders of the type used in rockets. Thus several unique and highly effective weapons have been evolved, that are not rockets at all.

Most striking, perhaps, are the recoilless mortars that deliver low-angle, "flat" fire, like cannon. They were developed especially to provide a very lightweight but hard-hitting weapon to knock out enemy pillboxes, and were used for this purpose in the last weeks of the war against Japan.

Recoil is eliminated as it is in the already-announced recoilless cannon, by leaving openings in the breech, so that enough of the expanding powder gases escape backward to offset the weapon's "kick". So successfully has this been worked out that the heavy base-plate required by ordinary mortars is not needed; the recoilless mortar is mounted on the standard Army machine-gun tripod.

Unlike the recoilless cannon, the mortar is a muzzle-loader, with the advantage of rapid fire which that method of serving brings. Since the shell cannot be dropped down the barrel when firing is horizontal or at a low angle, a small rocket is screwed into its nose. When the gunner pulls the string, this little rocket rams the shell down the barrel. The primer in the powder charge secured to its base hits the firing-pin—and out comes the shell again on its way to the target.

Another very effective weapon developed at the laboratory is the "one-shot" flame-thrower. Most flame-throwers have flasks of compressed air or other gas to push out their jets of inflammable liquid. This adds considerably to their weight. In the one-shot flame-thrower the necessary pressure is provided by the ignition of a cylinder of slow-burning rocket powder. Unlike its heavier forerunner, this flame-thrower cannot be turned on and off; once started, it delivers all its charge in one long, withering spurt. This is offset by its much lighter weight, also by the fact that refilling does not involve the use of heavy machinery for compressing air. A load of fuel and a charge of powder about the size of a Boy Scout knife are all that is required.

Weapons that are true rockets, yet do not rise into the air, are a group that were developed for the purpose of clearing paths through mine fields by dragging long trains of explosive athwart them, to be set off as soon as they reach favorable positions. One such is called the "snake": a rocket head with an upturned, ski-like snout, trailing two strings of high explosive charges behind it in long, light-metal protective strips. In action, the thing reminds one irresistably of the "nigger-chasers" of long-ago Fourth-of-July celebrations—only it is a thousand times bigger. And there is a rocket-towed mine-clearer that is even bigger than this; its heavier, more powerful rocket drags a string of bangalore torpedoes, which are lengths of light metal pipe filled with high explosive.

The Allegany Research Laboratory was entirely a research, development and testing establishment; the rockets and other weapons and ammunition developed there were manufactured elsewhere. Like practically all such wartime undertakings, it owed its success to the cooperative efforts of many heads and hands. Heading up the work for NDRC was Dr. C. N. Hickman, a physicist whose services were donated to the government by the Bell Telephone Laboratories. He reported to F. L. Hovde, in Washington, who had charge of all OSRD research on rockets. Dr. B. D. Van Evera, head of the chemistry department at the George Washington University, represented that institution as contracting organization. Dr. R. E. Gibson, a physical chemist on leave from the Geophysical Laboratory of the Carnegie Institution of Washington, directed research at the laboratory.

Science News Letter, April 6, 1946

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MEDICINE

New Anesthetic Related to Ether, But More Powerful

➤ A NEW anesthetic related to ether but more powerful, less irritating and with less disagreeable after-effects has been developed by Dr. John C. Krantz, Jr., of the University of Maryland School of Medicine.

Metopryl is the name of the new anesthetic which, chemically, is n-propyl methyl ether. Surgeons who have tried it report that it gives greater muscular relaxation and is good for long operations. It is said to have a pleasant odor.

Science News Letter, April 6, 1946

CHEMISTRY

Synthesizing Penicillin

Removing molecule of water stands between success and failure. Dr. Woodward predicts it will be done on a practical scale.

➤ A MOLECULE of water stands between success and failure to synthesize penicillin, Dr. R. B. Woodward of Harvard University told members of the American Association for the Advancement of Science.

Dr. Woodward is one of two young chemists who in 1944 performed the difficult feat of synthesizing quinine.

Penicillin, he declared, has not yet been synthesized except in micro amounts which can be detected by their effect on disease germs but are not yet available in the form of pure crystals. As an organic chemist, he believes that penicillin can be synthesized on a practical scale.

The trick seems to involve removing that molecule of water from another chemical, penicilloic acid. This acid is penicillin plus one molecule of water. When chemists got as far as penicilloic acid in their attempts to produce penicillin in the laboratory during the war, mold production of the drug was far behind the need for it. They thought then the problem was solved, because penicilloic acid can be synthesized easily by about a dozen different methods, a number of which are commercially practical.

Removing the molecule of water to produce penicillin seemed easy. But for two years it has stumped leading chemists in forty laboratories in this country and England.

The chemical structure of penicillin is known. It is a beta lactam. At first chemists rejected this structure for penicillin because beta lactams are very solid compounds whereas penicillin breaks down easily into a number of different chemicals. X-ray pictures of beta lactams, however, showed an unsuspected weakness in their structure. It might be called a bent or twisted molecule with its two parts on different planes, and at the bend or twist, one part can easily break off to form all the compounds which penicillin becomes under various chemical treatments.

One of the parts that breaks off when penicillin is given these chemical treatments is penicillamine. This is the part of penicillin that is effective in stopping disease germs. The rest of the compound is like the hilt of a dagger, useful for getting the killing edge to the scene of action.

Penicillamine stops germs by competing with either valine or cysteine according to present theories. These are amino acids needed by disease germs for food. Pencillamine from penicillin therefore may kill the germs by starving them through depriving them of necessary nourishment.

Even with fairly plentiful supplies of penicillin available from mold production, a synthetic product would have the advantage of being pure penicillin. The commercial penicillin now on the market may contain as many as four different penicillins, some of which are more effective remedies than others. Artificial production of one or another of these penicillins in pure form is now being attempted by forced feeding of the mold. This involves adding to its nourishment certain chemicals which will force or enable it to produce penicillin G or X or one of the other two varieties.

Science News Letter, April 6, 1946

ENGINEERING

Improved Methods for Extracting Cottonseed Oil

➤ NEW AND IMPROVED methods that extract more oil from cottonseed at less cost were revealed at the spring meeting of the American Society of Mechanical Engineers in Chattanooga, Tenn. N. Hunt Moore, Delta Products Co., Wilson, Ark., said that replacing hydraulic presses now used with a solvent process should enable commercial plants to reduce the residual oil in cottonseed meal from between 5.5% and 6.25% to between 1% and 1.50%.

This saving would mean an increase of about 45 pounds of oil from each ton of seed processed, he pointed out. In addition, Mr. Wilson said that the saving in labor from the solvent extraction would lower the cost of producing cottonseed oil.

Arnold Glass, Arthur H. Morgan and W. H. Baskervill of the University of Tennessee Engineering Experiment Station staff, reported the commercial development of a pressure cooker for cottonseed that increases the oil yield.

They announced studies showing that increases in pressure would reduce the cooking time for the seed to obtain a maximum amount of oil, and said that aging flaked cottonseed meats for 30 days before cooking would increase oil content from 4% to 5%.

Science News Letter, April 6, 1946

CHEMISTRY

Napalm Will Be Made Into G-I Liquid Soap

➤ NAPALM, that spelled death and destruction as an incendiary ingredient in wartime flame-throwers, will soon be used by the Army as a G-I liquid soap.

Within a few months, the War Department states, 50,000 gallons of a new quick-suds soap made of napalm will be available for everything from scrubbing barracks floors to G-I shampoos.

The new soap can be made by plants that turned out the flame-thrower material without any additional equipment and by using little more labor, it was reported.

Napalm is also reported to have a limited use in some hospital applications.

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Photo courtesy Oak Mfg. Co.

TESTING INSTRUMENTS IN ARTIFICIAL CLIMATE

The "climate" (temperature and humidity) in the big chest at left above is regulated by the two Micromax Controllers, on wall beneath window. Chest contains electrical insulation, and engineer is using L&N Insulation-Resistance Test Set to help show how it will stand up under actual weather conditions.

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Do You Know?

A *parachute* is fully open 1.6 seconds after the cord is pulled.

American *butter* production in 1945 was roughly 67% of that in 1941.

Tantalum oxide is being used successfully in the treatment of wounds and burns, an industrial physician reports.

Here is another tip for the cook: Vitamin losses during cooking are greater in leafy than in root vegetables.

Birds are often found with twigs and bark embedded in their bodies, accidentally acquired in flying against a bush or tree.

Aluminum *coal chutes* are now coming more widely into use because they are safe from the sulfur in the coal; sulfur does not eat aluminum.

Some *birds* prefer animal meat, other than insects, for food, others eat only vegetable food, and still others live principally on the eggs or young of insects which they get from under the bark of trunks or limbs of trees.

Dusting a *sugar beet* seed crop with DDT mixtures in Oregon eliminated destructive Lygus bugs so thoroughly that it was impossible to find any, where previously the average population was 19 bugs per scoop of an insect net.

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ASTRONOMY

Sunspot Cycles 22 Years

That the apparent 11-year cycle is only a half-cycle was discovered from a study of the magnetic polarity at the times of sunspot minima.

➤ SUNSPOT CYCLES are 22 years long, not 11 as previously supposed, Dr. Seth B. Nicholson of Mt. Wilson Observatory stated in an address before the American Association for the Advancement of Science. Dr. Nicholson spoke as retiring chairman of the Association's section on astronomy.

That the apparent 11-year cycle is only a half-cycle was discovered from a study of the magnetic polarity of the sunspot groups at the times of sunspot minima. The polarity of the groups at the end of any given 11-year period is exactly the reverse of what it was at the preceding minimum, and of what it will be at the next one.

Practically all sunspot activity takes place at solar latitudes roughly corresponding to the tropics on earth. At the beginning of a cycle, the spot groups appear along lines approximately 35 degrees north and south of the solar equator. They gradually move closer together, reaching solar latitudes of about 14 degrees as the spots become most numerous, and coming to within 7 or 8 degrees of the sun's equator as the cycle ends. Then spots of the new cycle appear again at the 35-degree latitudes.

Astronomers and earth-scientists alike are still far from complete knowledge regarding the significance of sunspot cycles in terrestrial affairs, Dr. Nicholson told his audience.

He said, in part: "Of the many correlations with solar activity which have been investigated, those related to the state of the ionosphere, to the frequency of auroras, and to changes in geomagnetism are by far the best established.

"Correlations with the weather were attempted as early as 1801 by Sir William Herschel before the periodic nature of sunspots had been recognized. The available weather records were so poor that Herschel used the price of wheat as an index of the weather instead of the recorded temperature and rainfall.

"That important relations between solar and terrestrial phenomena still remain to be discovered can hardly be questioned but when one considers the complex nature of the earth's atmosphere, it is not surprising that many attempts have failed. Correlations derived entirely by statistics need long records to be sure of their reality and scientific progress in this field is therefore slow."

Not Bombardment Weapons

Solar prominences, those enormous flame-like jets that spurt out from the sun's face, are not responsible for the bombardment of the earth with atomic beams, as has often been asserted. Evidence to this effect was presented by Dr. Robert McMath, director of the McMath-Hulbert Observatory.

Using two spectrographic instruments simultaneously, he and his associates were able to obtain a much more accurate measurement of the velocity of the streams of atoms that go out into these prominences than heretofore.

These streams move at speeds of about 12 miles a second—which is very slow motion for events on the sun. It is far below the velocity needed for escape from the sun's gravitational field, which is 387 miles a second. Only rarely have atomic streams of that velocity been observed, Dr. McMath stated.

Clouds of matter have been observed floating high above the sun's surface, the speaker continued. Since they cannot escape the pull of the sun's enormous gravity, some other force must be active in holding them up. The pressure of the sun's intense radiation is apparently at least part of the answer, but, Dr. McMath concluded, "much more observation and analysis are required before it becomes certain just what forces are acting and how they combine to produce the prominences on the sun."

Science News Letter, April 6, 1946

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WYOMING

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ECOLOGY

NATURE RAMBLINGS
by Frank Thone

Making May Flowers

➤ APRIL SHOWERS, the old jingle tells us, bring forth May flowers.

That is true enough; warmth and moisture through a period of three or four weeks are necessary to arouse the dormant plants and stimulate them to shoot up their flower stalks. But no one should mis-read the rime as meaning that May flowers are made in April. May flowers are not made by April showers, but by January snows, and by rains that fell last September and even last June.

Practically all of the flowering herbs that make a springtime woodland stroll such a delight are perennials. That means that the greater part of their growth was accomplished during the preceding season or seasons, and that the flowers you see now were pre-formed months ago and tucked away in snugly closed buds, usually under ground or right at the surface, where dead leaves and a blanket of snow can protect them at least slightly against the winter cold and (even more important) against drying out.

The flowers in these winter buds are recognizable as flowers, even in their embryonic state. By careful dissection, you can pry one open and recognize sepals, petals, stamens and pistil. Sections examined under the microscope show that they are made up of tissue still in the stage for most active growth, with cells very numerous and very small. This makes possible exceedingly rapid expansion when growing-time comes: the cells continue to divide, but they also swell up to full size and develop the thicker walls that betoken maturity. Johnny-jump-up almost literally jumps up, and so do all his bright little brothers and sisters.

One peculiar thing about most spring flowers is that to bring them forth they need not only the traditional April showers but December frost. There is something in the physiology of dormant buds, in a majority of spring-flowering plants, that makes a really severe chilling necessary before they will start to grow. This requirement for cold to break dormancy does not exist in warm-region plants, though even in the tropics some plants do go through dormant periods. In the cool-temperate and arctic regions, however, it is an excellent arrangement; else all plants might do what some foolish species regularly do—break into bloom during the false spring of a warm autumn, only to have their flowers nipped to naught by a sudden cold night.

Science News Letter, April 6, 1946

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CHEMISTRY

RDX In Itself Is Not A Secret Explosive

➤ RDX, THE SECRET of whose production the Canadian Communist M. P., Fred Rose, and the McGill University faculty member, Dr. Raymond Boyer, are alleged to have delivered into the hands of Soviet agents, is itself not at all a secret explosive.

It was a secret once—a German secret. For it was in Germany that this super-explosive was discovered, during the first World War. It is one of the innumerable things that chemistry has conjured out of the coal-tar pot. Chemically it is cyclotrimethylene-trinitramine. The Germans, however, were unable to find a way to produce it cheaply in quantity, so it did not achieve military importance at the time.

Between wars, Canadian chemists succeeded in developing a method for cheap mass production of RDX, and subsequently American chemists found an even better and cheaper procedure, so it began to figure increasingly in World War II explosive mixtures. RDX is far more violent than TNT, but is so unstable that it is unsuitable for use by itself. It is therefore ordinarily mixed with TNT to keep it from deteriorating.

Science News Letter, April 6, 1946

CHEMISTRY

Low-Cost Method Digests Oil Out of Fish Livers

➤ A SIMPLE, low-cost method for getting vitamin-rich oil out of cod, shark and other fish livers is the subject of patent 2,395,790, obtained by Ivan A. Parfentjev of Nanuet, N. Y. Instead of the elaborate and costly machinery for extracting the oil from the liver tissues by pressure and heating, Mr. Parfentjev literally digests it out. He puts the livers through an ordinary grinding machine, then acidifies lightly, adds a little pepsin, and lets the material stand until this enzyme has broken down the confining cell walls by the same kind of process that occurs in a man's stomach after he has eaten meat. In a few days the yellow oil rises to the surface and can be removed. The inventor points out that this method can be used to extract fish oils in the tropics and in other remote parts of the world, where transportation costs at present prevent the taking and shipping of whole fish livers.

Science News Letter, April 6, 1946

The usefulness of *radar* ends at the surface of the sea because radio waves travel very poorly in water.

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• Books of the Week •

ATOMIC ENERGY ACT OF 1946: Hearings Before the Special Committee of Atomic Energy—*Gov. Ptg. Office,* Part 1: 20 cents; Part 2: 30 cents; Part 3: 25 cents. Part 1: Statements of Harold D. Smith, James Forrestal, Harold Ickes and others; Part 2: Statements of Robert Hutchins, Harlow Shapley, Watson Davis, Karl Compton and others; Part 3: Statements of Irvin Stewart, August Klein, Robert Patterson, Frank B. Jewett and others.

BIBLIOGRAPHY ON THE PETROLEUM INDUSTRY—E. DeGolyer and Harold Vance—*Texas Engineering Experiment Station,* 730 p., illus., $2. References arranged under some 900 different subjects.

THE DIFFUSION OF ELECTROLYTES AND MACROMOLECULES IN SOLUTION—L. G. Longsworth, Charles O. Beckmann, Margaret Bender, Edward Bevilacqua, Ellen Bevilacqua, Douglas French, A. R. Gordon, Herbert Harned, Lars Onsager, Jerome Rosenberg, and J. W. Williams—*N. Y. Acad. of Sciences,* 136 p., tables and illus., $2. Annals of the New York Academy of Sciences, Vol. XLVI, Art. 5.

ECONOMIC DEMOGRAPHY OF EASTERN AND SOUTHERN EUROPE—Wilbert E. Moore—*Columbia Univ. Press,* 299 p., maps and tables, $3. A study of the population and economic structure of the predominantly agrarian states of Europe, presenting a comprehensive picture of their critical position in the continental economy.

THE GOGLI APPARATUS—AN INTERPRETATION OF ITS STRUCTURE AND SIGNIFICANCE—Leonard G. Worley—*N. Y. Acad. Sciences,* 55 p., diagrs. and illus., 75 cents. Annals of the New York Academy of Sciences, Vol. XLVII, Art. 1.

HOW TO KEEP A SOUND MIND—John J. B. Morgan—*Macmillan,* 404 p., $2.75, Rev. ed. of KEEPING A SOUND MIND. A textbook in mental hygiene for college courses, based on the theory that it is just as easy to form habits beneficial to mental health as it is to fall victim to detrimental habits. The author was professor of psychology at Northwestern University.

MANIFESTO FOR THE ATOMIC AGE—Virgil Jordan—*Rutgers Univ. Press,* 70 p., $1.50. A discussion of the dilemmas—political, sociological, economic, and ethical—which confront modern man.

MEDICINE IN INDUSTRY—Bernhard J. Stern—*Commonwealth Fund,* 223 p., tables, $1.50. The legislative, social, and scientific backgrounds of industrial medicine; and plans for a future advance toward adequate medical care for the worker.

A NATURALIST'S SCRAPBOOK—Thomas Barbour—*Harvard Univ. Press,* 219 p., illus., $3. A series of sketches by the late Dr. Barbour of Harvard, containing interesting sidelights on Louis and Alexander Agassiz and other curators of the Harvard Museum, and of the author's extensvie travels.

NAVY NURSE—Page Cooper—*McGraw,* 226 p., illus., $2.50. A human, intimate account, based on first hand observation both at home and abroad, about the Navy nurses in this war.

NEW CITIES FOR OLD: City Building in Terms of Space, Time and Money—Louis Justement—*McGraw,* 237 p., tables and illus., $4.50. How order, efficiency, and beauty in our cities can be achieved, considering all the problems along the way—economics, politics, administration, finance and design; and a practical, step-by-step plan for solving them.

NURSING IN COMMERCE AND INDUSTRY—Bethel J. McGrath—*Commonwealth Fund,* 369 p., tables and illus., $3. A guide to the manifold duties and responsibilities of the industrial nurse.

NURSING AND NURSING EDUCATION—Agnes Gelinas—*Commonwealth Fund,* 86 p., $1. A discussion of the rapid development of nursing as a profession, personnel policies and maintenance of standards in the profession, problems of education and plans for the future.

OUR OIL RESOURCES—Leonard M. Fanning, Ed.—*McGraw,* 331 p., tables and illus., $4. A study of the petroleum industry in the U. S., in terms of geographical knowledge and human resources—engineering and scientific learning, and private initiative and incentive.

OFF THE JOB LIVING: A Modern Concept of Recreation and Its Place in the Postwar World—G. Ott Romney—*A. S. Barnes,* 232 p., $2.75. The importance of recreation for a well-balanced life and a challenge to the individual and the community to realize the true meaning of recreation.

OUTLINE OF CULTURAL MATERIALS—George Murdock, Clellan Ford, Alfred Hudson, Raymond Kennedy, Leo Simmons, and John Whiting—*Yale Univ. Press,* 56 p., $1. An outline designed primarily for the organization of the available information on a large and representative sample of known cultures.

PUBLIC DOMAIN: Expiring Patents—S. Borowitz, Editor—*Scientific Development Corp.,* Weekly. $45 a year; $25 for six months; $10 for 10 weeks. A first issue of a new journal.

REPAIR-SHOP DIAGRAMS AND CONNECTING TABLES FOR LAP-WOUND INDUCTION MOTORS: Practical Step-by-step Information and Instructions for Connecting all Types of Windings for Two-phase and Three-phase Motors of 2 to 24 Poles—Daniel H. Braymer and A. C. Roe—*McGraw,* 404 p., tables and diagrs., $3.50, 2nd ed.

SCIENCE IN A CHANGING WORLD—Emmett J. Cable, Robert W. Getchell, William H. Kadesch—*Prentice Hall,* 637 p., tables and illus., $5, rev. ed. The basic facts about chemistry, geology, physics, climatology and astronomy described in terms of our everyday life. This revised edition contains fresh material on atomic fission, radar, the electron microscope, etc.

SUMMARY OF THE PROCEEDINGS: 1946 National Conference of the Professions, the Sciences, the Arts, the White Collar Fields—*Nat'l. Council of Scientific, Professional, Art and White Collar Organizations,* 27 p., illus., 15 cents.

SURFACE ACTIVE AGENTS—M. L. Anson, R. R. Ackley, Earl Fischer, David Gans, M. H. Hassialis, Rollin Hotchkiss, Donald Price, A. W. Ralston, Leo Shedlovsky, E. I. Valko—*N. Y. Acad. of Sciences,* 193 p., diagrs. and tables, $2.25. Annals of the New York Academy of Sciences, Vol. XLVI, Art. 6.

THEORY AND PRACTICE IN HISTORICAL STUDY: A Report of the Committee on Historiography—*Social Science Research Council,* 177 p., $1.75. A manual designed to help clarify thought about history and to aid historians in teaching and writing it.

WHAT SHALL WE DO ABOUT IMMIGRATION—Maurice R. Davie—*Public Affairs Committee,* 32 p., tables, 10 cents. The facts about immigration to the U. S. and our immigration laws; and proposals for liberalizing, without fundamentally changing our present immigration policy.

WORLD POLITICS FACES ECONOMICS: With Special Reference to the Future Relations of the United States and Russia—Harold D. Lasswell—*McGraw-Hill,* 106 p., $1.25. The interrelation between the economic policy and the security position of the United States.

THE WORLD WITHIN THE ATOM—L. W. Chubb—*Westinghouse Electric Corp.,* 31 p., tables and illus., free. How scientists explored the atom and learned to release its energy. A Westinghouse Little Science Series Booklet.

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PHYSICS

Civilian Control Demanded

Navy chief of research is against military control of further research on nuclear fission and its possible uses, with inevitable over-emphasis on "security."

➤ "THE NAVY believes that the entire control of atomic energy should be placed completely in civilian hands."

With this repetition of the opinion of his chief, Secretary of the Navy Forrestal, Rear Adm. H. G. Bowen, chief of the Office of Research and Development, set himself squarely against military control of further research on nuclear fission and its possible uses, with its inevitable over-emphasis on "security."

"We can have so much security that progress will be completely stopped or slowed to our great disadvantage," Adm. Bowen declared.

"Where there is need for advice and consultation with the military," he continued, "the Secretaries of War and the Navy can call upon officers of the Army and the Navy. The function of the military, however, should be strictly limited to the consultative and the advisory. . .

"Speaking not for the Navy now, but for myself as a private citizen of the United States, I am particularly apprehensive of any aspect of military control over atomic energy when I view that possibility in conjunction with the proposal to merge all the military, naval and air services in a single department, and under a single Chief of Staff. I believe that of itself the proposed merger plans to put so much authority in the hands of one individual that it might extend itself into the field of atomic energy and scientific research in general. Then indeed this nation could well be translated from a republic to military dictatorship.

"I believe, still speaking as an individual citizen, that there is more than a threat in the proposed merger legislation to place all scientific research under the thumb of a single, professional, military chief. Perhaps you will choose to wait until the legislation is reported to Congress to determine whether there is a foundation for my fear. But I am sure that you will concur in my belief that if control of atomic research and development is placed under military influence, and that if all military authority is lodged in a single, all-services Chief of Staff, then we will indeed have, as I have said, 'so much security that progress will be completely stopped.' "

One of the reasons why Adm. Bowen wants to see unhampered research on atomic energy go ahead as rapidly as possible is his hope of eventually seeing it used as a controlled means of power and not solely as a weapon worthy of the Apocalypse. He would like to see ships, merchant ships as well as warships, propelled by small atomic power-plants weighing only hundreds of tons, instead of the thousands of tons now tied up in boilers, turbines and huge tanks of oil. The space and weight saved could be utilized for cargo in merchant ships, for better protection in war craft. Perhaps the battleship's answer to the atomic bomb is the use of atomic power to make herself invulnerable.

Outside the field of nuclear physics, Adm. Bowen wants to see vigorous Naval research on such things as guided missiles which, he said, "are ushering in a new artillery era." Until atomic-energy propulsion becomes practicable, he hopes to see wider application of the simple, rugged gas turbine, which he believes may mean more to our economy than jet propulsion. Radio, radar and other applications of electronics are another direction for research to take.

One possible super-long-range weapon which the speaker believes to be possible is a two-stage rocket, that is, a big rocket carrying a smaller one, which is launched as the carrier-rocket's fuel becomes exhausted. The Germans, he stated, had a weapon which they called the A-10, which was designed to cross the Atlantic, and arrive on this side with a one-ton payload of high explosive. Substituting an atomic bomb for the relatively feeble TNT, this would be a most terrible weapon, and one practically impossible to intercept and destroy.

Science News Letter, April 6, 1946

Waterfowl sometimes mistake wet asphalt roads or pools of oil for water and make landings with disastrous results.

Truck tires made from selected varieties of cotton gave 300% more mileage in recent tests than those made from regular commercial cotton.

The *water hyacinth*, that clogs Southern rivers and lakes and makes navigation difficult, was an apparently harmless ornamental plant when it was brought from Venezuela about 60 years ago.

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Science News Letter, April 6, 1946

❁ *STORAGE vessel for liquefied natural gas, or other liquids at extremely low temperatures, is spherical in shape with an outer sheet metal shell, an insulating material within, and inside that a gas-tight thin membrane of metal alloy that can withstand 260 degrees below zero, Fahrenheit. This membrane is corrugated.*

Science News Letter, April 6, 1946

❁ *ECHO SOUNDER, an aid to navigation in treacherous waters, has a rapidly oscillating quartz crystal that sends a high frequency signal to the bottom of the water and receives the returning reflected signal. The device automatically translates the elapsed time into depth.*

Science News Letter, April 6, 1946

❁ *TOOL STEEL, recently developed and tested, is claimed to provide a satisfactory combination of hardness and toughness. It is airhardened, provides good hardness in heavy sections, and keeps dimensional changes in heat treatment to a minimum.*

Science News Letter, April 6, 1946

❁ *ELECTRONIC TUBES, the most powerful ever built and the smallest ever made, are shown in the picture side by side for comparison. The 200-kilowatt giant weighs 80 pounds and is used in government transmitters for beamed overseas broadcasts. The midget is a hearing-aid tube, 0.7 ounce in weight.*

Science News Letter, April 6, 1946

❁ *SCREW DRIVER has a connection between the handle and the shaft that permits the handle to turn farther than the shaft after a predetermined amount of force has been applied. Its use prevents stripping the threads of a hard-to-start screw by applying an excessive force.*

Science News Letter, April 6, 1946

❁ *POWER TOOL for home workshops is a combination affair that can be used for grinding, sanding, polishing, buffing and sawing. The basic machine, by replacement of parts, performs the first four operations. For sawing, the sandwheel is replaced by a circular saw, and a saw table mounted over it.*

Science News Letter, April 6, 1946

❁ *WINDING TOOL for fishermen, size of a nail clip, enables them to make a perfectly wrapped joint of the steel wire leader with the fish hook. The leader wire is stuck through the eye of the hook and turned back on itself. Free end and wire are grasped by the tool and wrapped together by rotating the device.*

Science News Letter, April 6, 1946

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